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Published in:
Marine Biology Research

DOI:
10.1080/17451000.2014.904885

Publication date:
2015

Document version
Publisher's PDF, also known as Version of record

Marine Biology Research

ISSN: 1745-1000 (Print) 1745-1019 (Online) Journal homepage: http://www.tandfonline.com/loi/smar20

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To cite this article: Jørgen G. Nielsen, Werner Schwarzhans & Franz Uiblein (2015) Review of the Indo-West Pacific ophidiid genera Sirembo and Spottobrotula (Ophidiiformes, Ophidiidae), with description of three new species, Marine Biology Research, 11:2, 113-134, DOI: 10.1080/17451000.2014.904885

To link to this article: http://dx.doi.org/10.1080/17451000.2014.904885

Marine Biology Research, 2015
Vol. 11, No. 2, 113–134, http://dx.doi.org/10.1080/17451000.2014.904885
http://zoobank.org/urn:lsid:zoobank.org:pub:5C523099-D826-495E-B880-98B99B1D1714

ORIGINAL ARTICLE

Review of the Indo-West Pacific ophidiid genera *Sirembo* and *Spottobrotula* (Ophidiiformes, Ophidiidae), with description of three new species

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Abstract
Currently, three of the seven described species of *Sirembo* Bleeker, 1858 and both species of *Spottobrotula* Cohen & Nielsen, 1978 are considered valid. The present revision is based on 73 specimens of *Sirembo* known from the Red Sea to Japan and southwards to off northwestern Australia and northern New South Wales and 19 specimens of *Spottobrotula* known from the Persian Gulf to the Mozambique Channel and from the Andaman Sea. The main characters separating the two genera are the number of long rakers on the anterior gill arch and the form of the sagittal otolith. Based on this distinction *Spottobrotula amaculata* Cohen & Nielsen, 1982 is transferred to *Sirembo*. While newly caught specimens can easily be identified by their colour pattern, preserved material requires identification based on meristic and morphometric characters. Three new species are herein described, *Sirembo wami*, *Spottobrotula mossambica* and *Spottobrotula persica*, while *Sirembo jerdoni* is reported for the first time from Vietnam. These and all other species of the two genera can be identified by combining number of long gill rakers, number of pseudobranchial filaments, number of pectoral fin rays, number and size of scales between dorsal fin origin and lateral line, and prepelvic and pelvic fin length in per cent of SL. The distinction from other genera is discussed.

Key words: *Generic revision, new species, Ophidiidae,* Sirembo, Spottobrotula

Introduction

The two ophidiid genera *Sirembo* Bleeker, 1858 and *Spottobrotula* Cohen & Nielsen, 1978 are known from the western Indian Ocean (Red Sea and Persian Gulf southward to Mozambique Channel) eastwards to Japan and northwestern Australia and northern New South Wales (Figure 1) at depths from the upper littoral zone to the upper continental slope. Newly caught specimens are easily identified by their colour pattern, but the colour tends to bleach after preservation to varying degrees. Preserved fish can be identified by the combination of meristic and morphometric characters, such as number of long rakers on anterior gill arch, pseudobranchial filaments, pectoral fin rays, scales between dorsal fin origin and lateral line, and prepelvic and pelvic fin length in per cent of SL.

Five of the nine previously described species of the two genera are here regarded as valid: *Sirembo imberbis* (Temminck & Schlegel, 1846) (northern Australia to Japan), *Si. jerdoni* (Day, 1888) (Gulf of Suez to Philippines and northeastern Australia), *Si. metachroma* Cohen & Robins, 1986 (eastern Australia), *Spottobrotula amaculata* Cohen & Nielsen, 1982 (northwestern Australia to Philippines) and *Sp. mahodadi* Cohen & Nielsen, 1978 (Andaman Sea).

Cohen & Nielsen (1978) placed *Sirembo* and *Spottobrotula* in two different tribes within the subfamily Neobythitinae, Sirembini and Neobythitini, respectively, according to the position of the base of the pelvic fins. Later, Nielsen et al. (1999) decided to refrain from splitting up the Neobythitinae into tribes, but they still used the position of the pelvic

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Published in collaboration with the Institute of Marine Research, Norway

(Accepted 27 February 2014; first published online 8 October 2014)

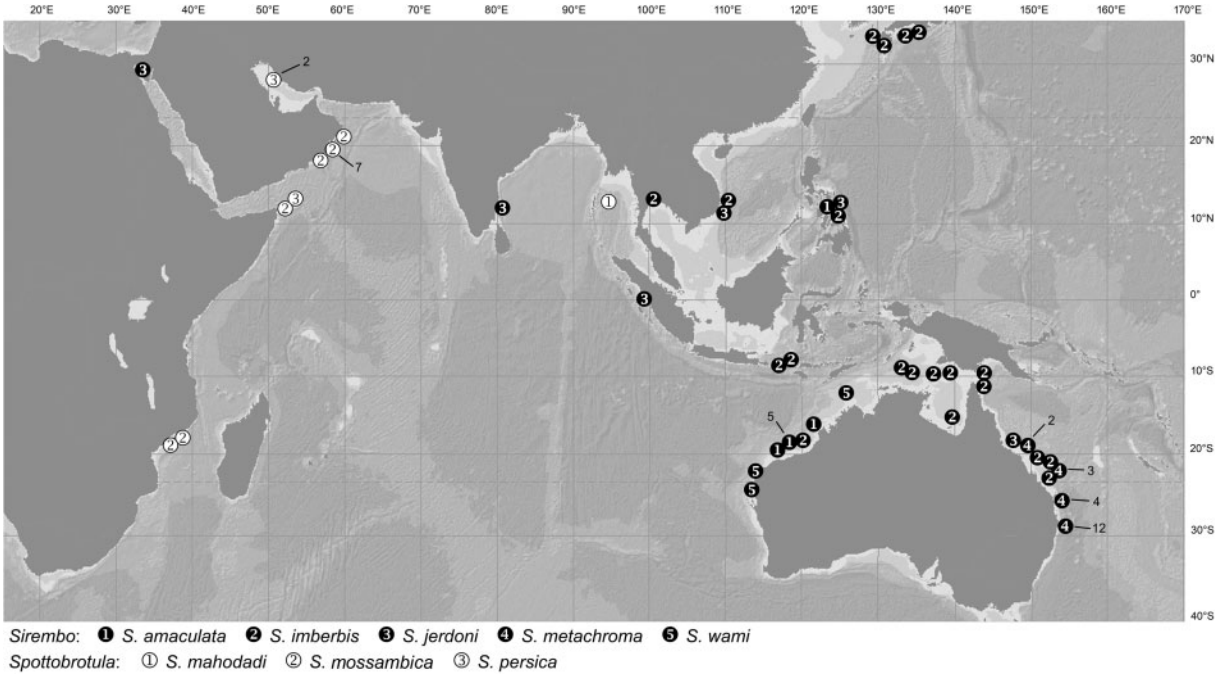

Figure 1. Distribution of examined specimens of *Sirembo* and *Spottobrotula* species. Numbers not encircled indicate number of neighbouring stations.

fins for separating the genera. However, additional material became available for the current revision that weakens the prepelvic length as the main separating character of the two genera used by Nielsen et al. (1999) (now 9.0–14.5% SL in *Sirembo* vs. 15.5–20.5% SL in *Spottobrotula*). Here we confirm the validity of the two genera and describe three new species: one is referred to *Sirembo*, which now holds five species, and two to *Spottobrotula*, now with three species.

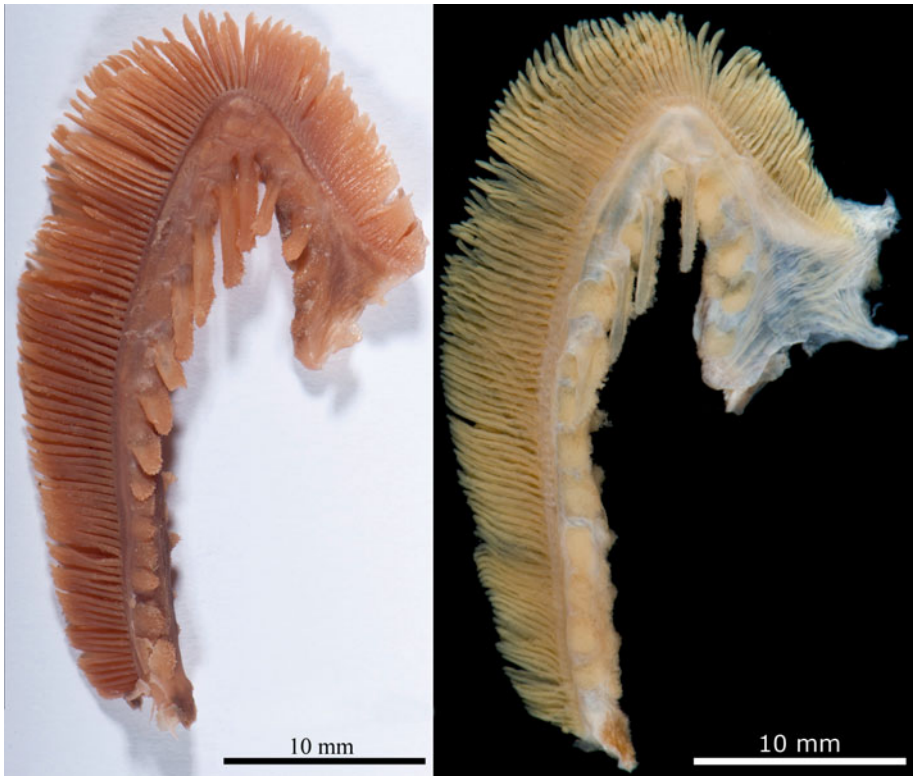

Figure 2. Anterior right gill arch: left – *Spottobrotula mossambica*, holotype, ZMUC P771715, SL 183 mm; right – *Sirembo wami*, holotype, WAM P22339.001, SL 252 mm.

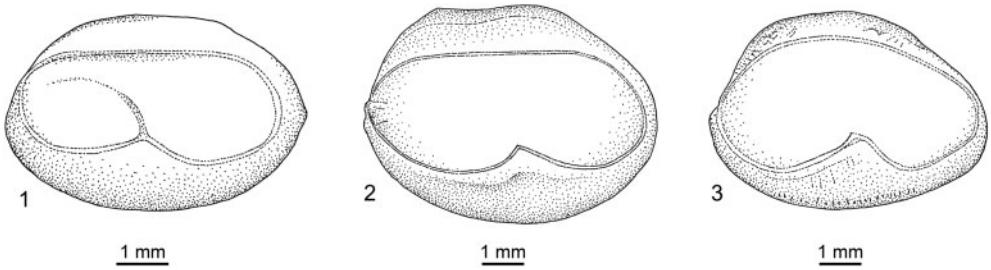

Figure 3. Right sagitta from: (1) *Petrotyx sanguineus* (Meek & Hildebrand, 1928), ANSP 188852, SL 127 mm; (2) *Sirembo imberbis*, ZMUC P77753, SL 171 mm; (3) *Spottobrotula mahodadi*, holotype, KUMF 02842, SL 216 mm.

Materials and methods

The present revision is based on 92 specimens from various museum collections, including fresh colour photographs of recently collected specimens from research cruises (2007 and 2008) investigating the fishery resources off Oman, Arabian Sea (McKoy et al. 2009), from the Iranian Shrimp Research Center, Bushehr, Gulf of Iran, and from a fish market in Nha Trang, Vietnam.

Ichthyological terminology, measurements and counts follow Nielsen et al. (1999). Prepelvic length is measured from the upper jaw symphysis to the base of the pelvic fins. The information given under 'Distribution' is based on the specimens examined here and from literature where the species are illustrated and thus allow verification. Institutional abbreviations follow Eschmeyer (2014). Other abbreviations are: SL = standard length, HT = holotype, PT = paratype, *Si.* = *Sirembo*, *Sp.* = *Spottobrotula*.

Taxonomy

Ophidiiformes L. S. Berg, 1937
Ophidiidae Rafinesque, 1810
Neobythitinae Radcliffe, 1913

Sirembo Bleeker, 1858
(Table I; Figures 1–6)

Sirembo Bleeker, 1858: 22 (type species *Brotula imberbis* Temminck & Schlegel, 1846 by subsequent designation of Vaillant (1888)); Cohen & Nielsen 1978: 19; Cohen & Robins 1986: 253; Nielsen et al. 1999: 88.
Brotella Kaup, 1858: 92 (type species *Brotula imberbis* Temminck & Schlegel, 1846).
Umalius Herre & Herald, 1951: 310 (type species *Umalius philippinus* Herre & Herald, 1951).

Diagnosis

A genus of the ophidiid subfamily Neobythitinae (Nielsen et al. 1999) differing from other genera in the subfamily by the following combination of characters: body rather robust with dorsal fin origin above vertebrae 1–5; fully scaled head and body; large eyes, almost equal to length of snout; pelvic fins with two rays in each bound together with tough skin; no spines on preopercle; opercular spine short,

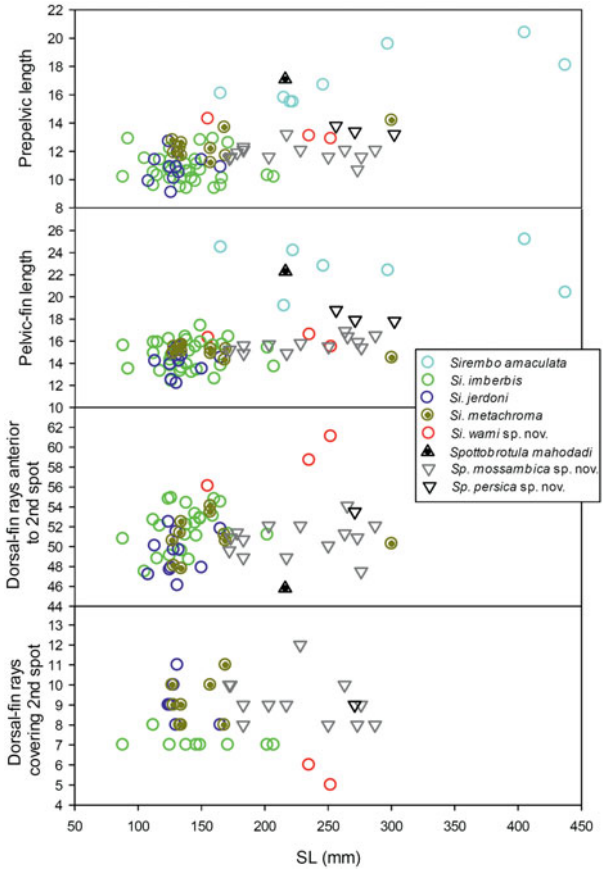

Figure 4. Two morphometric characters (distance from snout to pelvic fin origin and pelvic fin length (both in per cent SL)) and two meristic characters (number of dorsal fin rays anterior of the second dark spot and number of dorsal fin rays covered by the second spot) plotted against SL in five species of *Sirembo* and three species of *Spottobrotula*.

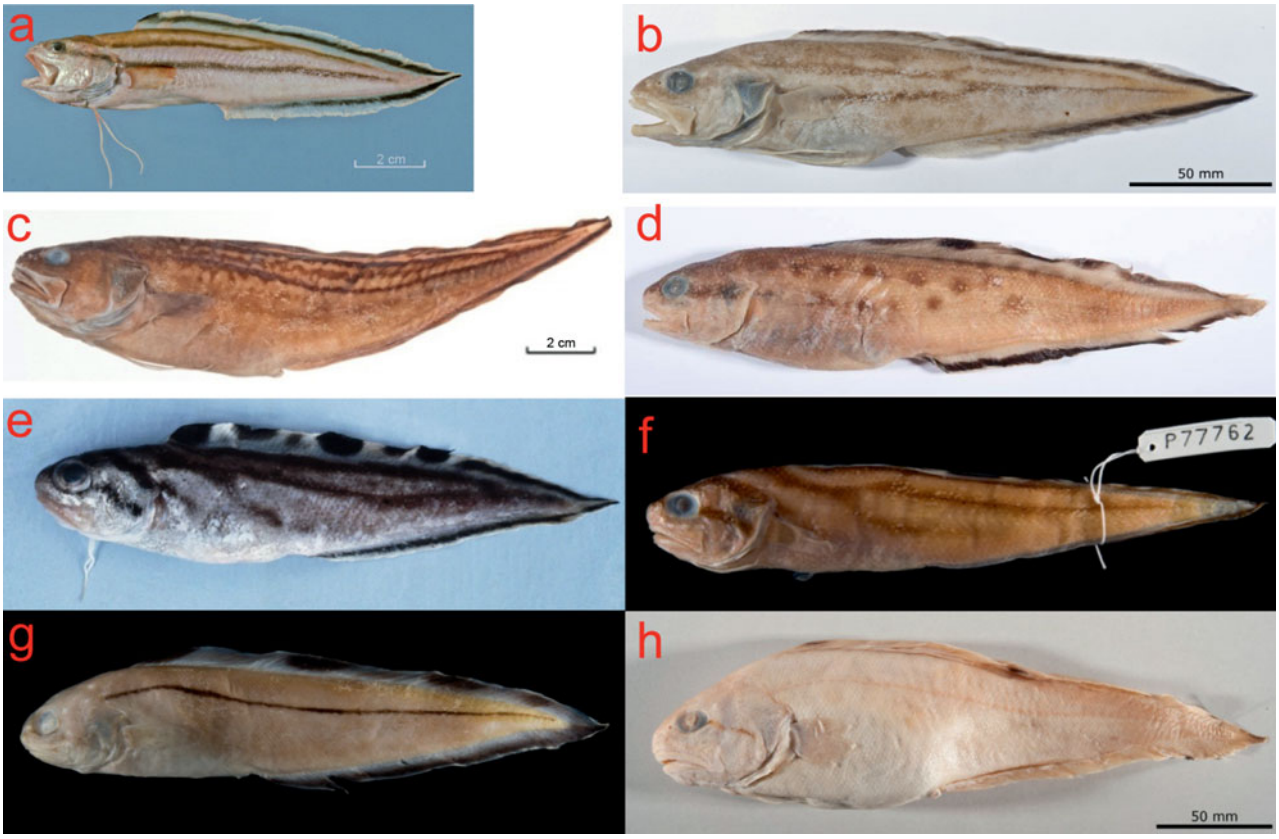

Figure 5. *Sirembo* spp: (a) *Si. amaculata*, CSIRO CA 3025, SL 178 mm (fresh, Alastair Graham photo); (b) *Si. amaculata*, CSIRO H 6571-07, SL 215 mm (preserved for six years, Alastair Graham photo); (c) *Si. amaculata*, USNM 224567, holotype, SL 295 mm (preserved for 35 years, Sandra Raredon photo); (d) *Si. imberbis*, NSMT P 75979, SL 202 mm (preserved for 20 years; shown mirror-inverted for comparative reasons); (e) *Si. jerdoni*, ZMUC P77745, SL 124 mm (fresh, Thomas Gloerfelt-Tarp photo); (f) *Si. jerdoni*, ZMUC P77762, SL 132 mm (preserved for 30 years); (g) *Si. metachroma*, QM I. 33201, SL 169 (preserved for 12 years); (h) *Si. wami*, WAM P. 22339.001, holotype, SL 252 mm (preserved for 40 years).

not reaching rear margin of head; 3–5 long rakers on anterior gill arch; 18–40 pseudobranchial filaments; a single median basibranchial tooth patch; teeth granular, also present on palatines; precaudal vertebrae 13–15; dorsal rim of otolith and of large sulcus almost straight. Coloration varies much with black spots and/or ocelli on dorsal fin, median part of anal fin often with black band, body and/or head with oblique or horizontal dark bands or horizontal rows of rather large dark spots.

Similarity

Sirembo and *Spottobrotula* are very similar as mainly indicated by the sagittal otolith exhibiting a very large, shallow sulcus with an indentation at the centre of the ventral margin and being positioned on a strongly convex inner face and by the high number of pseudobranchial filaments (16–42). *Sirembo* differs from *Spottobrotula* by having 3–5 long rakers on the anterior gill arch (vs. 9–11 in *Spottobrotula*) and the dorsal rim of the otolith and the sulcus almost straight (vs. distinctly convex in *Spottobrotula*). Another neobythitin species, *Petrotyx* Heller & Snodgrass, 1903, has a similar sagittal otolith morphology, suggesting relationship to the present two genera (Figure 3).

Distribution

Recorded from the Red Sea and from off southeastern India to Japan and southward to northern New South Wales and off northwestern Australia, at depths of 1–211 m.

Remarks

The following species originally referred to *Sirembo* were later reassigned to other genera:

Sirembo gnathopus Regan, 1921 now *Hoplobrotula gnathopus*; *Sirembo grandis* Günther, 1877 now *Spectrunculus grandis*; *Sirembo guentheri* Vaillant, 1888 now *Bathyonus laticeps* (Günther, 1878); *Sirembo messieri* Günther, 1878 now *Cataetyx messieri*; *Sirembo metriostoma* Vaillant, 1888 now *Monomitopus metriostoma*; *Sirembo microphthalmus* Vaillant, 1888 now *Penopus microphthalmus*; *Sirembo muraenolepis* Vaillant, 1888 now *Benthocometes robustus* (Good & Bean, 1886); *Sirembo nigripinnis* Alcock, 1889 now

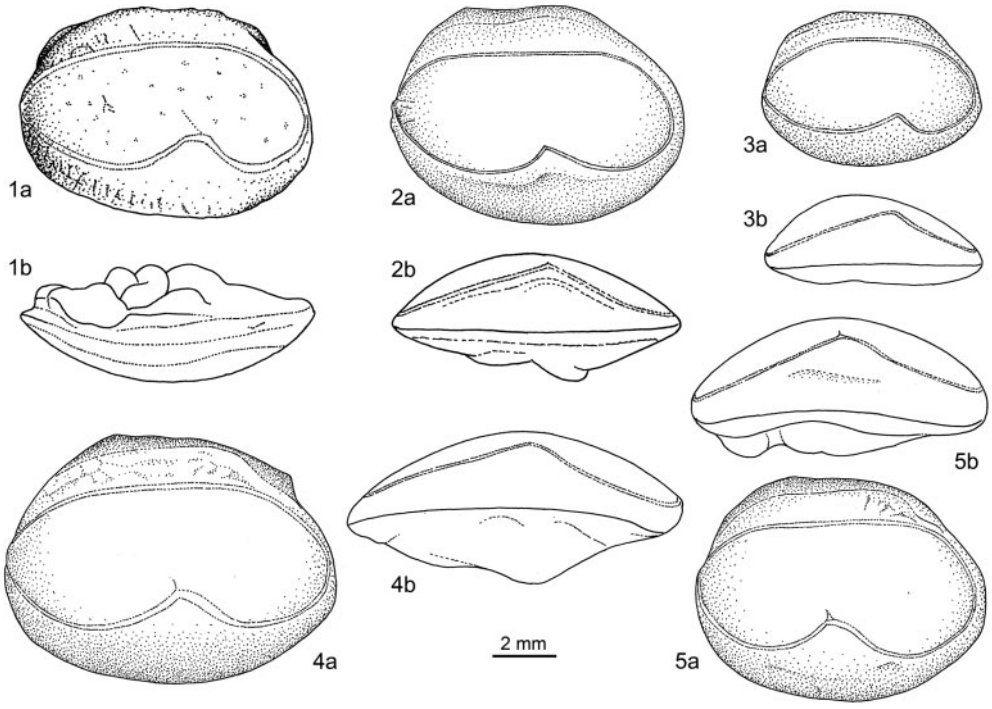

Figure 6. *Sirembo* (right otoliths): (1) *Si. amaculata*, ZMUC P77717, paratype SL 297 mm (1a median view, 1b dorsal view); (2) *Si. imberbis*, ZMUC P77753, SL 171 mm (2a median view, 2b ventral view); (3) *Si. jerdoni*, ZMUC P77745, SL 130 mm (3a median view, 3b ventral view); (4) *Si. metachroma*, QM I. 23906, SL 300 mm (4a median view, 4b ventral view); (5) *Si. wami*, WAM P.22339.001, holotype, SL 252 mm (5a median view, 5b ventral view).

Monomitopus nigripinnis; and *Sirembo oncerocephalus* Vaillant, 1888 now *Bassozetus oncerocephalus*.

The following species were synonymized by Cohen & Robins (1986): *Brotella maculata* Kaup, 1858 now *Sirembo imberbis* (Temminck & Schlegel, 1846); *Sirembo everriculi* Whitley, 1936 now *Sirembo imberbis* (Temminck & Schlegel, 1846); and *Umalius philippinus* Herre & Herald, 1951 now *Sirembo jerdoni* (Day, 1888).The new generic definition requires the transfer of *Spottobrotula amaculata* to *Sirembo*. Five species of *Sirembo* are here recognized as valid: *Si. amaculata*, *Si. imberbis*, *Si. jerdoni*, *Si. metachroma* and *Si. wami* sp. nov.

Key to species of *Sirembo*

1a. Lateral line distinct and black; head and body uniformly brownish ..... *Si. metachroma*

1b. Lateral line not distinct, brown or light; head and/or body with bands and spots 2

2a. Scales between origin of dorsal fin and lateral line 5–11; prepelvic length 9.9–12.5% SL 3

2b. Scales between origin of dorsal fin and lateral line 15–20; prepelvic length 13.0–20.5% SL 4

3a. Head and anterior part of body with 3–4 broad, black, oblique bands; anal fin origin below dorsal fin rays 27–34; 5–7 scales between origin of dorsal fin and lateral line ..... *Si. jerdoni*

3b. No oblique bands on head and body; anal fin origin below dorsal fin rays 24–27; 9–11 scales between origin of dorsal fin and lateral line ..... *Si. imberbis*

4a. Body uniformly brownish; a dark band from eye running postero-ventrally to hind edge of opercle; two black blotches in dorsal fin; length of pelvic fins 15.5–16.5% SL; prepelvic length 13.0–14.5% SL ..... *Si. wami* sp. nov.

4b. Body with 4–6 alternating black and light horizontal bands in smaller, and vermicular bands in larger specimens; no dark band behind eye; length of pelvic fins 19.0–25.0% SL; prepelvic length 15.5–20.5% SL ..... *Si. amaculata*

Sirembo amaculata (Cohen & Nielsen, 1982) (Table I; Figures 1, 4–6)

Spottobrotula amaculata Cohen & Nielsen, 1982: 497, fig. 1 (type locality off Caduruan Point, Visayan Sea, Philippines); Gloerfelt-Tarp & Kailola 1984: 88 (colour photo); Nielsen et al. 1999: 91; Hoese et al. 2006: 566.

Table I. Meristic and morphometric characters of *Sirembo* spp. Format for most measurements: minimum (average) maximum.

	Si. wami sp. nov.			*Si. amaculata*			*Si. imberbis*		*Si. jerdoni*		*Si. metachroma*		
	HT	HT + 2 PT	*n*	HT	HT + 13 spms.	*n*	33 spms.	*n*	13 spms.	*n*	HT	HT + 8 spms.	*n*
Standard length (in mm) – SL	252	155–252	3	295	149–437	14	84–207	32	108–165	13	168	127–300	10
Meristic characters													
Dorsal fin rays	96	96 (96.3) 97	3	94	94 (97.1) 102	10	87 (92.6) 97	30	91 (93.5) 97	13	97	96 (97.8) 99	10
Caudal fin rays	9	9	3		9	6	9	30	8 (8.8) 9	10	9	9	10
Anal fin rays	72	72 (72.3) 73	3	73	71 (72.9) 75	10	67 (70.4) 75	30	65 (66.3) 69	13	74	73 (73.9) 75	10
Pectoral fin rays	24	24 (25.3) 26	3	27	24 (26.4) 28	8	22 (23.3) 25	28	22 (22.7) 24	11	22	21 (22.6) 24	10
Pelvic fin rays	2	2	3	2	2	5	2	32	2	9	1	2	10
Pseudobranchial filaments	29	29 (30.6) 33	3	25	24 (30.3) 40	14	16 (19.9) 24	32	18 (23.1) 27	12	18	18 (22.2) 26	10
Precaudal vertebrae	33	15	3	14	14 (14.5) 15	10	13 (13.3) 14	32	14	13	14	14 (14.5) 15	10
Total vertebrae	54	52 (53.0) 54	3	51	51 (52.7) 54	9	50 (52.0) 54	29	49 (50.3) 53	13	53	53 (53.6) 54	10
Long rakers on anterior gill arch	4	4	3	3	3 (3.9) 4	14	3 (3.9) 4	33	3 (3.8) 4	13	4	4 (4.2) 5	10
Total gill rakers	17	16 (16.7) 17	3		11 (14.7) 19	3	13 (15.2) 17	29	13 (16.1) 20	10	18	15 (16.8) 19	10
Ant. dorsal ray above vertebra no.	1	1	3	4	0 (3.7) 5	7	2 (4.1) 5	31	1 (2.2) 3	11	2	2 (2.7) 3	10
Ant. anal ray below dorsal fin ray no.	31	30 (30.7) 31	3	26	26 (28.6) 31	7	24 (25.6) 27	31	27 (30.1) 34	11	28	27 (27.5) 29	10
Ant. anal ray below vertebra no.	19	18 (18.3) 19	3	18	18 (18.7) 19	14	16 (17.3) 18	31	17 (18.4) 20	11	17	17 (17.7) 18	10
Scales between dorsal origin and lat. line	15	14 (15.0) 16	3		17 (18.5) 20	7	9 (9.8) 11	29	5 (6.2) 7	11	20	14 (15.1) 16	10
Morphometric characters in per cent SL													
Head length	24.0	23.5 (24.0) 24.5	3	27.5	23.0 (24.5) 26.0	7	18.5 (21.5) 24.5	31	20.0 (22.2) 24.5	13	21.5	21.5 (22.6) 23.5	10
Depth origin anal fin	22.5	19.0 (20.6) 22.5	3	20.5	16.5 (19.0) 20.0	6	14.5 (16.3) 17.5	30	15.0 (16.2) 18	11	19.0	16.5 (18.0) 19.5	10
Upper jaw length	12.5	12.0 (12.2) 12.5	3	12.0	11.0 (12.2) 13.0	6	9.3 (10.6) 12.0	30	9.7 (10.7) 12.0	13	10.5	10.0 (11.0) 12.0	10
Posterior height of maxillary	4.8	4.2 (4.6) 5.1	3	5.0	4.1 (4.8) 5.1	6	3.1 (3.7) 4.9	30	3.7 (4.1) 4.6	13	4.2	3.7 (4.0) 4.5	10
Diameter of orbit	5.6	5.6 (5.8) 6.1	3	4.8	4.3 (4.6) 5.1	6	4.7 (5.8) 6.9	31	5.2 (5.9) 6.6	13	5.5	5.1 (5.5) 5.9	10
Interorbital width	6.1	5.3 (5.7) 6.1	3	6.4	5.1 (5.8) 6.5	6	3.3 (4.2) 5.1	29	4.4 (5.4) 6.3	13	6.1	5.1 (5.5) 6.1	9
Postorbital length	13.5	13.0 (13.4) 14.0	3		13.0 (13.9) 15.0	4	9.7 (11.5) 13.0	30	10.5 (12.1) 13.0	11	11.5	11.5 (12.6) 13.5	10
Prepelvic length	13.0	13.0 (13.4) 14.5	3	18.5	15.5 (17.2) 20.5	8	9.4 (10.8) 13.0	31	9.1 (10.9) 12.5	11	13.7	11.0 (12.4) 14.0	10
Preanal length	49.5	46.0 (47.7) 49.5	3	49.5	42.0 (46.9) 52	6	41.0 (44.6) 49.5	30	43.5 (46.5) 48.5	13	47.5	41.5 (45.3) 50	10
Predorsal length	25.0	22.5 (23.5) 25.0	3	27.5	25.0 (27.1) 29.0	6	21.0 (22.9) 25.0	31	20.0 (21.8) 23.5	13	24.0	23.0 (23.9) 25.0	10
Base of pelvic fin to anal fin origin	35.5	32.0 (33.8) 35.5	3	32.5	27.5 (31.1) 33.5	4	30.5 (34.8) 40.0	31	33.5 (36.6) 40.0	13	34.0	30.5 (33.7) 36.5	10
Pectoral fin length	10.5	9.1 (10.1) 10.5	3	10.5	10.0 (11.5) 13.4	6	9.8 (11.0) 12.5	29	8.5 (10.5) 12.4	13	9.6	9.2 (10.2) 11.5	10
Pelvic fin length	15.5	15.5 (16.2) 16.5	3	22.5	19.0 (22.7) 25.0	7	12.5 (14.8) 17.5	30	12.5 (14.1) 15.5	13	14.5	14.5 (15.1) 15.5	10

Material examined (14 specimens, 149–437 mm SL).

Holotype: USNM 244567, SL 295 mm, off Caduruan Point, Visayan Sea, Philippines, 11°38′N, 123° 52′E, RV *Stingray V*, 24 m otter trawl, 90 m, 5 June 1978.

Paratypes: USNM 224568, two specimens, SL 165 and 405 mm, and ZMUC 77717, 297 mm SL, same data as for holotype.

Non-types: WAM P. 26253.007, SL 232 mm, off Cape Boileau, NW Australia, 18°32′S, 121°00′E, bottom trawl, 52 m, 4 June 1978; AMS I 22805–020, two specimens, SL 220–250 mm, north of Port Hedland, NW Australia, 18°28′S, 118°15′E, RV *Soela*, Engel trawl, 150–156 m, 28 March 1982; CSIRO CA 3025, SL 178 mm, off Port Hedland, NW Australia, 19°06.9′S, 117°17.2′E, RV *Soela*, bottom trawl, 152–160 m, 1 October 1982; CSIRO CA 3642, SL 190 mm, off Cape Lambert, NW Australia, 19°03.4′S, 117°24.6′E, RV *Soela*, bottom trawl, 142–144 m, 29 January 1983; CSIRO H 3247-01, three specimens, SL 149–210 mm, off Cape Lambert, NW Australia, 19°06.4′S, 117°07.2′ E, RV *Southern Surveyor*, bottom trawl, 169–175 m, 7 October 1990; CSIRO H 6571–07, SL 215 mm, female, off Cape Leveque, NW Australia, 14°59′S, 121°39′E, RV *Southern Surveyor*, bottom trawl, 211 m, 26 June 2007; WAM P. 30949.001, SL 437 mm, NW Australia, 19°30′S, 116°47′E, RV *Samara*, bottom trawl, 200 m, 13 November 1994.

Diagnosis

Sirembo amaculata differs from the other four *Sirembo* species by the coloration of head and body that changes ontogenetically from a pale abdomen and alternating black and white horizontal bands on the body in smaller specimens (165–175 mm SL) to a darker abdomen and vermiculate bands in larger specimens (295–405 mm SL). Also the following combination of characters is diagnostic: pelvic fins inserted below preopercle; prepelvic length 15.5–20.5% SL; 17–20 scale rows between origin of dorsal fin and lateral line; 3–4 long rakers on anterior gill arch; pseudobranchs with 24–40 filaments; and pectoral fins with 24–28 rays.

Description

The principal meristic and morphometric characters are shown in Table I. Body rather slender, deepest at beginning of dorsal fin and with tapering tail. Lateral line indistinctly curving upwards anteriorly. Tip of snout naked. Remainder of head and body covered with overlapping scales. Size of a scale from below pectoral fin 1.8% SL (SL 232 mm). Number of scales between origin of dorsal fin and lateral line 17–20. Base of pelvic fins below preopercle. Origin of dorsal fin above vertebrae 0–5 (one specimen above 0, the remaining above 4–5). A small skin flap above base of pectoral fins. Diameter of eye shorter than length of snout. Anterior nostril placed midway between upper lip and eye, with raised rim, posterior nostril a simple pore. Upper jaw ends just behind eye. Strong opercular spine not reaching hind margin of opercle. No spines on preopercle. Anterior gill arch with 4–5 knob-like rakers on upper branch, one long raker in the angle and lower branch with 2–3 long rakers followed by up to 11 small knobs, of which the ventral ones are often united. Length of longest rakers equals that of longest gill filaments. Pseudobranchial filaments 24–40.

Head pores. Infraorbital pores 5, three anterior and two very small posterior; no supraorbital pore; mandibular pores 6, three anterior and three very small posterior; lower preopercular pore variably present or absent.

Dentition. Teeth small and granular and arranged in irregular rows. Palatines, premaxillaries and dentaries with broad dentigerous bands. Vomer with rounded tooth patch, anteriorly with widely flaring arms. A single, median, basibranchial tooth patch.

Otolith (Figure 6). Thick, large otolith with strongly convex inner face and much less curved outer face. Otolith height 1.4 in length. Dorsal rim only slightly and regularly curved. Sulcus large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation slightly behind middle of sulcus, dorsal rim of sulcus slightly curved. Sulcus height 1.7 times otolith height.

Axial skeleton (based on radiographs). Number of precaudal vertebrae 14–15. Length of anterior neural spine 4/5 of second spine; neural spines 2–15 slightly depressed and with blunt tips; neural spines 2–10 decreasing and 11–15 increasing in length. Bases of neural spines 4 to 12–13 enlarged. Parapophyses on vertebrae 8 to 14–15. Pleural ribs on vertebrae 2 to 13–14 and epipleural on vertebrae 5 to 13–14.

Coloration (Figures 5a–c)

In *Sirembo amaculata* three colour patterns can be distinguished, which are related to the size of examined specimens and hence may represent different ontogenetic coloration phases, here described as phases I, II and III.

Colour phase I (Figure 5a; CSIRO CA 3025, SL 178 mm; USNM 224568, SL 165–178 mm): Four well-separated dark stripes, two on head and body and two on unpaired fins. One stripe placed mid-

laterally starting behind eye, up to orbit diameter in width, inclining downwards from behind eye to above pectoral fin base, continuing horizontally straight almost to caudal fin base, and becoming thinner and following lateral line posteriorly. One stripe placed dorso-laterally starting at dorsal head margin behind eye, thinner than mid-lateral stripe, crossing the dorsal region of the head and body, following the lateral line along its first half, then inclining upwards to about mid dorsal fin base and continuing along the fin base posteriorly for about 1/3 of fin base length. Dorsal fin stripe similar in width to mid-lateral stripe, starting in a dark spot covering the tips of the anterior dorsal rays and continuing until posterior end of fin, leaving the fin proximally and distally pale. The anal fin stripe proceeds closely along fin base, starting at or behind fin origin, extending onto tip of caudal fin, leaving the fin distally pale. All four stripes are dark brown in fresh fish, the head and body below the dorso-lateral stripe being pale, while the area above the dorso-lateral stripe is light brown. In preserved specimens the stripes are mostly retained, the colour being light brown to brown, the two fin-associated stripes becoming darker distally and the overall body being pale or pale brown.

Colour phase II (Figure 5b; CSIRO H6571-07, SL 215 mm; WAM P. 26253-007, SL 232 mm): Four stripes as in phase I, but in addition one stripe connecting the mid- and dorso-lateral stripes by covering the formerly unpigmented part of the lateral line.

Colour phase III (Figure 5c; USNM 224567, SL 295 mm; USNM 224568, SL 405 mm; ZMUC P77717, SL 295–405 mm): In this phase there is a single dorso- to mid-lateral stripe of about half to full pupil width, assumedly the result of a composition of the three phase II body stripes (see above), with the pigmentation on the head deriving from the dorso-lateral stripe and then covering the lateral line until close to the caudal fin base. Between this lateral stripe and the dorsal fin base above is a vague band of dark patches and, separated from it, a more distinct dark stripe along the dorsal fin base. The dorsal and anal fin stripes are identical to the stripes in phases I and II. In a larger specimen (WAM P. 30949-001, 437 mm SL) almost no stripe pigmentation is retained and instead of the lateral-line stripe only small, dark spots covering the skin at regular intervals were found.

Distribution

Known from off northwestern Australia, Indonesia, Philippines and the West Pacific (Timor Sea). Caught in bottom trawls at depths from 52 to 211 m.

Similarity

Sirembo amaculata is most similar to *Si. jerdoni*, with horizontal and oblique stripes on the head and body and an indistinct lateral line. *Sirembo amaculata* differs from *Si. jerdoni* by the number of scales between the origin of the dorsal fin and the lateral line (17–20 vs. 5–7) and by having a longer pelvic fin (19.0–25.0% SL vs. 12.5–15.5% SL, respectively).

Remarks

This is the only *Sirembo* species in which the colour pattern changes ontogenetically. The descriptions are preliminary, as they are based on a small number of specimens and fresh colour information was available only for a single specimen (phase I).

Sirembo imberbis (Temminck & Schlegel, 1846) (Table I; Figures 1, 4–6)

Brotula imberbis Temminck & Schlegel, 1846: 253 (type locality Bay of Oomura, Japan).
Brotella maculata Kaup, 1858: 92.
Sirembo everriculi Whitley, 1936: 47.
Sirembo imberbis. Gloerfelt-Tarp & Kailola 1984: 89 (colour photo); Machida 1984: 100 (colour photo plate 84); Sainsbury et al. 1985: 82 (colour photo); Cohen & Robins 1986: 257, plate 2A; Lindberg & Krasyukova 1989: 236, fig. 149; Hoese et al. 2006: 565.

Material examined (33 specimens, 88–207 mm SL). ZMUC P771714, SL 88 mm, off Nagasaki; QM I.16475, SL 133 mm, Torres Strait, 10°10′S, 143°14′E, bottom trawl, 6 December 1974; WAM P. 26294.005, SL 165 mm, off NW Australia, 18°05′S, 119°45′E, RV *Courageous*, st. COR 787, 130–140 m, 3 June 1978; USNM 226484, five specimens, SL 106–149 mm, Visayan Sea, Philippines, 11°28′42″N, 123°45′45″E, RV *Sting Ray V*, st. T-4, 0–69.5 m, 5 June 1978; ZMUC P77753, SL 171 mm, Saleh Bay, Sumbawa, Indonesia, bottom trawl, 150–280 m, July 1981; ZMUC P77756, SL 159 mm, south of Lombok, bottom trawl, 100 m, 16 July 1981; NTM S. 12696–004, SL 84 mm, north of Cape Wessel, Arafura Sea, 10°11′S, 136°44′E, 55–56 m, 28 October 1990; NTM S. 13313-023, SL 140 mm, Arafura Sea, 9°18′S, 133°12′E, 153 m, 6 November 1990; QM I. 27849, SL 138 mm, Gulf of Carpentaria, 15°29.5′S, 139°41.1′E, trawl, 45 m, 7 December 1990; QM I. 27921, five specimens, SL 117–146 mm, Gulf of Carpentaria, 10°30.7′S, 138°42.3′E, bottom trawl, 53 m, 9 December 1990; NTM S. 13277-011, 160 mm, east of Cape York, 11°21′S, 142°58′E, 22 m, 1 December 1991; NTM S. 13547-013, three specimens, 138–149 mm, all females, Arafura Sea, 9°42.4′S, 133°23.2′E, 107 m, 3 October 1992; NSMT P

75979, SL 202 mm, Mimase Fish Market, Japan, 4 December 1992; ZMUC P771022, SL 124 mm, fish market Bangkok, 1 December 1993; QM I. 34067, SL 126 mm, Capricorn Group North, Queensland, 22° 31′S, 151°44′E, bottom trawl, 71 m, 7 October 2000; NSMT P 65232, SL 207 mm, Iwamoto fishing port, Kyushu, Japan, 9 October 2001; NSMT P 68995, SL 105 mm, Vietnam, Nha Trang fish landing port, 6 December 2003; QM I. 36323, SL 92 mm, Capricorn Channel, 23°32.1′S, 152°04.4′E, dredge, 91 m, 13 May 2004; QM I. 36533, SL 142 mm, East of Shoalwater Bay, 22°20.1′S, 151°07.5′E, dredge, 100 m, 15 May 2004; QM I. 36768, SL 112 mm, NE of Percy Isles, 21°27.9′S, 150°54.3′E, dredge, 70 m, 18 September 2004; NSMT P 76264–76265, two specimens, SL 134–166 mm, Saga fish landing port, Shikuko, Japan, 24 December 2006; NSMT P 75833, SL 125 mm, Saga fish landing port, 27 December 2006.

Diagnosis

Sirembo imberbis differs from the other four *Sirembo* species by the body and head having one or more horizontal rows of dusky blotches, often rather indistinct, and 3–6 black blotches on the dorsal fin. Also the following combination of characters is diagnostic: pelvic fins inserted below eyes; prepelvic length 9.4–13.0% SL; 9–11 scale rows between origin of dorsal fin and lateral line; 3–4 long rakers on anterior gill arch; pseudobranch with 16–24 filaments; and pectoral fins with 22–25 rays.

Description

The principal meristic and morphometric characters are shown in Table I. Body robust with tapering caudal part, highest behind tip of pectoral fin. Head and body completely covered by overlapping, cycloid scales. Length of a scale from below pectoral fin 2.7% SL (SL 202 mm). Lateral line curving upwards above pectoral fin. Snout rounded. Mouth horizontal and maxilla vertically expanded and sheathed, postero-dorsally ending below or just behind posterior edge of eye. Numerous small papillae on lips. Anterior nostril with short tube, placed midway between upper lip and posterior nostril, the latter a mere hole. Eye diameter slightly longer than snout length. Strong opercular spine ending short of hind margin of opercle. No spines on preopercle. Origin of dorsal fin above base of pectoral fin. Origin of anal fin a little anterior to midpoint of body. Pectoral fin peduncle much higher than long. Small skin flap above basis of pectoral fin. Base of pelvic fin below hind margin of eye; fin ending below base or anterior part of pectoral fin. Anterior gill arch with 3–4 short, knob-like rakers on upper branch, one long raker in the angle and lower branch with 2–3 long rakers followed by 8–9 knob-like rakers; in some specimens the lower rakers are joined. Pseudobranchial filaments 16–24.

Head pores. Infraorbital pores 3, all three anterior; no supraorbital pore; mandibular pores 5–6, three anterior and 2–3 posterior; lower preopercular pore absent.

Dentition. All teeth granular. Palatines with several, irregular rows. Vomer boomerang-shaped with teeth in 2–5 rows. Dentaries and premaxillaries with teeth in 4–5 irregular rows. One elongate, median basibranchial tooth patch, most often with anterior half broader than posterior half.

Otolith (Figure 6). Thick, large otolith with strongly convex inner face and moderately convex outer face. Otolith length to height 1.35–1.45. Dorsal rim slightly curved, almost straight at its middle part. Sulcus large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation slightly behind middle of sulcus, dorsal rim of sulcus slightly curved, almost straight at its middle part. Otolith height to sulcus height 1.6–1.8.

Axial skeleton (based on radiographs). Number of precaudal vertebrae 13–14. Length of anterior neural spine 1/2–2/3 of second spine; neural spines 3 to 7–9 depressed and with pointed to blunt tips; neural spines 3–8 decreasing and 9–13 increasing in length. Bases of neural spines 4–5 to 9–10 enlarged. Parapophyses on vertebrae 7–8 to 13. Pleural ribs on vertebrae 3–4 to 13. Epipleural ribs on vertebrae 3–13.

Coloration (Figure 5d)

Colour pattern variable, but is best characterized by having one or more horizontal rows of large, dusky spots along sides of body with the uppermost row placed close to dorsal fin, with spots partly covering it proximally. Dorsal fin with up to six dark blotches of varying sizes placed along fin margin. Anal fin pale proximally and distally, with a distinct, black band in the middle.

Distribution

Distributed in the tropical western Pacific from Japan and Philippines to Queensland and off northwestern Australia. Caught in bottom trawls at depths from 15 to 180 m.

Similarity

Sirembo imberbis is most similar to *S. jerdoni* as both have 3–4 developed gill rakers, prepelvic length

between 9.5 and 13.0% SL, and number of pectoral fin rays between 22 and 25. *Sirembo imberbis* differs from *Si. jerdoni* in the colour pattern (no oblique bands on head and anterior part of body vs. distinct black oblique bands), number of scales between origin of dorsal fin and lateral line (9–11 vs. 5–7), and origin of anal fin below dorsal fin rays 24–27 (vs. 27–34).

Sirembo jerdoni (Day, 1888)
(Table I; Figures 1 and 4–6)

Brotula jerdoni Day, 1888: 804 (type locality off Madras); Menon & Rama Rao 1963: 47 (colour photo).
Sirembo imberbis. Rahimullah 1943: 55.
Sirembo jerdoni. Gloerfelt-Tarp & Kailola 1984: 89 (colour photo); Menon & Rama Rao 1970: 47, fig. 1 (new combination); Rama Rao 1976: 511; Sainsbury et al. 1985: 84 (colour photo); Cohen & Robins 1986: 257, pl. 2B; Nielsen et al. 1999: 89; Hoese et al. 2006: 565.
Umalius philippinus Herre & Herald, 1951: 312, fig. 1 (type locality Philippines).
Umalius heraldi Herre, 1953: 818 (new name proposed for misidentification of this species as *Lepophidium marmoratum* by Umali, 1935. Type locality Manila market, Philippines).

Material examined (13 specimens, 108–165 mm SL). USNM 216444, SL 165 mm, Gulf of Suez, Red Sea, 31 August 1976; USNM 226486, six specimens, SL 113–150 mm, Visayan Sea, Philippines, 11°28′42″ N, 123°45′45″E, RV *Sting Ray V*, station T-4, 0–69.5 m, 5 June 1978; ZMUC P77745–746, two specimens, SL 124–130 mm, off Sumatra, 00°04′S, 99°01′E, bottom trawl, 50 m, 6 May 1983; ZMUC P77761–762, two specimens, SL 108–132 mm, Portonovo, India, 1984; QM I. 23573, SL 128 mm, female, South of Slashers Reef, 18°34.9′S, 147°08.6′E, bottom trawl, 57 m, 21 January 1985; ZMUC P771718, SL 126 mm, Be fish market, Nha Trang, Vietnam, 21 November 2012.

Diagnosis

Sirembo jerdoni differs from the other four *Sirembo* species by having 2–4 broad, black, oblique bands on the head and anterior part of the body and by the following combination of characters: dorsal fin with 3–4 black spots; pelvic fins inserted below or slightly behind eyes; prepelvic length 9.1–12.5% SL; 5–7 scale rows between origin of dorsal fin and lateral line; 3–4 long rakers on anterior gill arch; pseudobranch with 18–27 filaments; and pectoral fins with 22–24 rays.

Description

The principal meristic and morphometric characters are shown in Table I. Body robust with tapering caudal part, highest behind tip of pectoral fin. Head and body completely covered with overlapping, cycloid scales. Length of a scale from below pectoral fin 2.4% SL (SL 166 mm). Lateral line curving slightly upwards above pectoral fins. Snout rounded, slightly protruding over upper jaw symphysis. Mouth horizontal and maxilla vertically expanded, ending below or just behind posterior edge of eye. Anterior nostril with a short tube, placed midway between upper lip and posterior nostril, the latter a mere hole. Diameter of eye slightly longer than snout. Strong opercular spine ending short of hind margin of opercle. No spines on preopercle. Origin of dorsal fin far forward, above posterior margin of opercle. Anal fin origin at midpoint of fish. Pectoral fin placed below midline of body, with peduncle much higher than long. Small skin flap above basis of pectoral fin. Pelvic fin base below end of maxillary; fin ending below posterior edge of opercle. Anterior gill arch with 3–4 short, knob-like rakers on upper branch, one long raker in angle between the two branches and lower branch with three long rakers followed by 7–10 short rakers which in some specimens are united. Pseudobranch with 18–27 filaments.

Head pores. Infraorbital pores 5–6, three anterior and 2–3 posterior; no supraorbital pore; mandibular pores 6, three anterior and three posterior; lower preopercular pores 1 or 2.

Dentition. Palatines with 3–4 rows of pointed teeth, longest in inner row. Vomer subtriangular with about 20 pointed teeth in 3–4 rows. Dentaries and premaxillaries with 2–3 rows of pointed teeth. One slender, median basibranchial tooth patch.

Otolith (Figure 6). Thick, large otolith with strongly convex inner face and only slightly less convex outer face. Otolith length to height 1.3–1.4. Dorsal rim slightly curved, usually slightly depressed anteriorly. Sulcus large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation slightly behind middle of sulcus, dorsal rim of sulcus slightly curved. Otolith height to sulcus height 1.6–1.8.

Axial skeleton (based on radiographs). Precaudal vertebrae 14. Anterior neural spine twisted and about 2/3 the length of second spine. Neural spines 3–9 depressed and decreasing in length. Bases of neural spines 4–10 enlarged. Parapophyses on vertebrae 7–14. Pleural ribs on vertebrae 3 to 13–14 and epipleural ribs on vertebrae 3–10.

Coloration (Figures 5e–f)

Three to four dark lateral stripes crossing head and/or body, all inclining downwards at differing degrees, having a width of about pupil diameter. The ventralmost stripe reaching from eye to margin of opercle, in front of pectoral fin origin, followed by a stripe above starting from dorsal head margin above eye, descending to midbody behind pectoral fin base. A third stripe starting from dorsal body margin right behind head, bending downwards at eye level and ending at lower third of body above or slightly behind anal fin origin. The dorsalmost fourth stripe overlaps initially with the third stripe, but follows lateral line along posterior half of body until close to tip of tail. In some specimens (e.g. ZMUC P77745), however, the third stripe is not evident and is completely replaced by the fourth stripe. Dorsal fin with an additional thin stripe starting at dorsal fin origin and extending along dorsal fin base to posterior third of fin. Three large, rounded black spots placed on dorsal fin, one spot at fin origin, another at midbody, and the third spot at about two-thirds of fin, with three smaller spots placed in between. In some specimens the most prominent spot at midbody is partly surrounded by a contrasting white ring, i.e. forming a partial ocellus (Uiblein & Nielsen 2005). The last 3/4 of the dorsal fin is covered by a dark stripe of about pupil diameter in width. In some specimens (e.g. ZMUC P77745), however, there are only dark spots and/or pigmented patches along the entire dorsal fin and neither an ocellus nor a stripe. The anal fin shows a stripe of less than half-pupil diameter, placed intermediate on fin extending onto ventral part of caudal fin, leaving about 1/4 of distal anal-fin section unpigmented. In several specimens, however, this stripe is placed more distally, covering the anal fin margin. Body and head pale brown dorsally, darker in fresh fish and all stripes and spots are dark brown to black. In preserved material colours are generally weaker. Eyes bluish.

Distribution

Found in the Gulf of Suez and from off eastern India to Vietnam and the Philippines and southwards to off northeastern Queensland and off northwestern Australia (Sainsbury et al. 1985: 84) at depths between 1–70 m. New record for Vietnam.

Similarity

See 'Similarity' under *Sirembo imberbis*.

Sirembo metachroma Cohen & Robins, 1986 (Table I; Figures 1 and 4–6)

Sirembo metachroma Cohen & Robins, 1986: 497, fig. 1 (type locality northwest of Cape Moreton, Queensland); Nielsen et al. 1999: 89; Hoese et al. 2006: 565.

Material examined (10 specimens, 127–300 mm).

Holotype: QM I. 13005, SL 168 mm, 7 miles NW of Cape Moreton, Queensland, 110 m, 27 February 1975.

Paratype: WAM P. 25739.005, SL 134 mm, same data as for holotype.

Non-types: QM I. 23906, SL 300 mm, female, off Swain Reef, NE Queensland, 21°57′S, 153°05′E, trawl, 190 m, 29 August 1983; ZMUC P771719, SL 157 mm, off northern New South Wales, 29°00′S, 153°49′E, RV *Kapala*, field no. K 90-08-36, bottom trawl, 152–156 m, 6 May 1990; QM I. 33201, two specimens, SL 128–169 mm, ENE of Cape Moreton, Queensland, 27°58′S, 153°37′E, trawl, 145 m, 4 August 2001; QM I. 38579, four specimens, SL 127–157 mm, East of Noosa, SE Queensland, 26°19′42″S, 153°45′12″E, trawl, 113 m, 19 July 2002.

Diagnosis

Sirembo metachroma differs from the other four known *Sirembo* species by a distinct, black lateral line and a uniformly brownish head and body. Also the following combination of characters is diagnostic: four black blotches in dorsal fin; anal and caudal fins black except for a thin light margin; pelvic fins inserted below midway between upper jaw and hind margin of preopercle; prepelvic length 11.0–14.0% SL; 14–16 scale rows between origin of dorsal fin and lateral line; 4–5 long rakers on anterior gill arch; pseudobranch with 18–26 filaments; and pectoral fins with 21–24 rays.

Description

The principal meristic and morphometric characters are shown in Table I. Body rather slender, deepest behind pectoral fins and with tapering tail. Lateral line distinct, curving slightly upwards anteriorly. Tip of snout naked. Remainder of head and body with overlapping scales; scales in holotype covered by thick layer of mucus. Length of a scale from below pectoral fins 1.9% SL (SL 232 mm). Number of scales between origin of dorsal fin and lateral line 14–16. Base of pelvic fins in some specimens placed on a vertical line close to posterior part of upper jaw and in others closer to hind margin of preopercle. Pelvic fins reaching 1/3–1/2 to anal fin. Origin of dorsal fin above vertebrae 3–5. A small skin flap above base of pectoral fins. Diameter of eye almost

equal in length to snout. Many minute papillae on snout and lips. Anterior nostril with raised rim, placed almost midway between upper jaw and eye; larger posterior nostril a simple pore. Upper jaw ends just behind eye. Strong opercular spine not reaching hind margin of opercle. No spines on preopercle. Anterior gill arch with 3–4 knob-like rakers on upper branch, one long raker in the angle and lower branch with 3–4 long rakers followed by 7–10 small knobs. Longest rakers equal to or slightly shorter than longest gill filaments; rakers seem to become relatively longer with growth. Pseudobranchial filaments 18–26.

Head pores. Infraorbital pores 5–6, three anterior and 2–3 posterior; supraorbital pore 1; mandibular pores 6, three anterior and three posterior; lower preopercular pores 1 or 2. All pores marked by white-coloured pore walls.

Dentition. Granular teeth in irregular rows on palatines, dentaries and premaxillaries, some specimens with pointed teeth in outer rows on premaxillaries and dentaries. Vomer broad and subtriangular with concave sides. A single median basibranchial tooth patch with a slight constriction in the middle.

Otolith (Figure 6). Thick, large otolith with strongly convex inner face and only slightly less convex outer face. Otolith length to height 1.3–1.4. Dorsal rim slightly curved, usually slightly depressed anteriorly. Sulcus large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation slightly behind middle of sulcus, dorsal rim of sulcus slightly curved. Otolith height to sulcus height 1.6–1.8.

Axial skeleton (based on radiographs). Number of precaudal vertebrae 14–15. Length of anterior neural spine half of second spine. Neural spines 3 to 8–10 slightly depressed and with blunt tips, neural spine numbers 3 to 8–10 decreasing and numbers 9 to 14–15 increasing in length. Base of neural spines 4–10 enlarged. Parapophyses on vertebrae 8–14. Pleural ribs on vertebrae 3–14 and epipleural ribs indistinct.

Coloration (Figure 5g)

Distinct dark lateral line stripe, rather thin, with a width of less than half pupil diameter. Dorsal fin unpigmented at base with four large, dark, ventrally rounded spots reaching down from fin margin to *c.* 3/4 of fin; area in between and behind spots patchily pigmented. The anteriormost dorsal fin spot covering fin origin distally, the second spot placed at mid-body at first third of fin, followed by the third spot at 3/4 of fin and a smaller fourth spot behind. Anal fin with a dark brown stripe that covers distal half of fin with exception of thin unpigmented margin. Head and body pale brown and head with 5–7 small white spots behind and above eye.

Distribution

Known from off Queensland and New South Wales, trawled at depths from 110 to 190 m.

Similarity

Sirembo metachroma is most similar to *Si. wami* sp. nov., with a uniformly brown body colour without bands and spots, 2–4 black blotches in dorsal fin and about 15 scales between origin of dorsal fin and lateral line. They differ, however, by *Si. metachroma* having a distinct, black lateral line (vs. indistinct in *Si. wami*), no dark band postero-ventrally from the eye (vs. present in *Si. wami*), 18–26 pseudobranchial filaments (vs. 29–33 in *Si. wami*) and body depth 16.5–19.5% SL (vs. 19.0–22.5 in *Si. wami*).

Remarks

Australian Museum, Sydney, holds 16 lots of *S. metachroma* not examined by us, but identified by Mark McGrouther (AMS) based on the distinct, black lateral line. The majority (11 lots) was caught close together off northern New South Wales and five lots off the east coast of Queensland (18°–27°S).

Sirembo wami sp. nov.
(Table I; Figures 1 and 4–6)

Sirembo metachroma Cohen & Robins, 1986 (in part: 253, fig. 1B).

Material examined (three specimens, 155–252 mm SL).

Holotype: WAM P. 22339.001, SL 252 mm, off Cape Cuvier, Western Australia, 24°15′S, 113°26′E, 9 July 1972.

Paratypes: AMS I. 21613-001, SL 155 mm, off northwestern Australia, 13°3′S, 124°02′E, RV *Courageous*, field no. 05.1103, bottom trawl, 138–142 m, 3 June 1979; USNM 226483, SL 235 mm, off Western Australia, 22°52′S, 113°26′E, 136–178 m, 15 August 1979.

Diagnosis

Sirembo wami sp. nov. differs from the other four *Sirembo* species by the presence of a dark band running postero-ventrally from the eye almost to the hind edge of the operculum and two black blotches on the dorsal fin, one anteriorly and the other about halfway to the caudal fin. Also the following combination of characters is diagnostic: pelvic fins inserted below preopercle; prepelvic length 13.0–14.5% SL; 14–16 scale rows between

origin of dorsal fin and lateral line; four long rakers on anterior gill arch; pseudobranch with 29–33 filaments and pectoral fin with 24–26 rays.

Description

The principal meristic and morphometric characters are shown in Table I. When the holotype and paratypes differ, the data of the paratypes are mentioned in parentheses. Body robust with tapering caudal part, highest behind tip of pectoral fin. Head and body completely covered with overlapping, cycloid scales. Length of a scale from below pectoral fins 2.8% SL (SL 252 mm). Lateral line distinct, curving slightly upwards above pectoral fins. Snout rounded, slightly protruding over upper jaw symphysis. Mouth horizontal and maxilla vertically expanded, ending a little behind eye. Anterior nostril with a short tube, placed midway between upper lip and posterior nostril, the latter nostril a mere hole. Diameter of eye longer than snout. Strong opercular spine ending short of hind margin of opercle. No spines on preopercle. Origin of dorsal fin far forward, above opercle. Anal fin origin at midpoint of body. Pectoral fin placed below midline of body, with peduncle much higher than long. Pelvic fin base below end of maxillary; pelvic fin reaching almost halfway to anal fin. Anterior gill arch with four short, knob-like rakers on upper branch, one long raker in the angle between the two branches, and lower branch with three long rakers followed by 8–9 (10) short rakers (Figure 2). About 125 gill filaments, the longest equal in length to the longest gill rakers. Pseudobranch with 33 (29) filaments.

Head pores. Infraorbital pores 6, three anterior and three posterior; supraorbital pore 1; mandibular pores 6, three anterior and three posterior; lower preopercular pores 2.

Dentition. Palatines, dentaries and premaxillaries with several rows of small, pointed teeth. Vomer subtriangular with many small, pointed teeth. One large, median basibranchial tooth patch.

Otolith (Figure 6). Thick, large otolith with strongly convex inner face and only slightly less convex outer face. Otolith length to height 1.3. Anterior and posterior tips blunt, dorsal rim slightly and regularly curved. Sulcus large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation at about middle of sulcus, dorsal rim of sulcus slightly curved. Otolith height to sulcus height 1.6.

Axial skeleton (based on radiographs). Precaudal vertebrae 15. Anterior neural spine 2/3 the length of second spine. Neural spines 3 to 9–10 depressed and decreasing in length. Bases of neural spines 4 to 11–12 enlarged. Parapophyses on vertebrae 8–15, pleural ribs on vertebrae 1 to 14–15, and epipleural ribs on vertebrae 4–12.

Coloration (Figure 5h)

One dark head stripe with width of pupil diameter, descending from eye to margin of opercle, anterior to pectoral fin base. Two dark, rounded spots on dorsal fin, one covering completely anterior-distal part of fin, the second spot placed at mid fin, at *c.* 2/3 of body, leaving an unpigmented fin margin. Head and body pale brown.

Distribution

The three known specimens were caught in bottom trawls on the lower continental shelf off Western Australia between 136 and 178 m of depth.

Etymology

The specific name, *wami*, refers to the acronym for Western Australian Museum (WAM).

Similarity

Sirembo wami sp. nov. is most similar to *Si. metachroma* (see respective species account).

Remarks

In spite of several minor morphometric and colour pattern differences, Cohen & Robins (1986: 254) considered the two specimens (SL 235–252 mm) then known from off Western Australia referable to *Sirembo metachroma*. They explained the differences as due to the fact that the two Western Australian specimens were considerably longer than the eastern Australian type material. However, a specimen (QM I. 23906) subsequently caught off eastern Australia, longer (SL 300 mm) than the two from off Western Australia, was found to show a colour pattern like the type material of *Si. metachroma*.

Spottobrotula Cohen & Nielsen, 1978
(Table II; Figures 1–4 and 7–9)

Spottobrotula Cohen & Nielsen, 1978: 41, fig. 64 (type species *Spottobrotula mahodadi* Cohen & Nielsen, 1978 by original designation); Cohen & Nielsen 1982: 497; Nielsen et al. 1999: 91.

Diagnosis

A genus of the ophidiid subfamily Neobythitinae (Nielsen et al. 1999) differing from other neobythitin genera by the following combination of characters: Body rather robust, with dorsal fin origin above vertebrae 0–3; fully scaled head and body; pelvic fins

with two rays in each bound together with tough skin; no spines on preopercle; opercular spine short, not reaching rear margin of opercle; a prominent skin flap above base of pectoral fins; 9–11 more or less prolonged rakers on anterior gill arch; 30–42 pseudobranchial filaments; a single median basibranchial tooth patch; granular teeth, also present on palatines; precaudal vertebrae 15–16; dorsal rim of otolith and of large sulcus distinctly convex. Dorsal part of head and body with rather large dark or light spots, dorsal fin with 2–4 black blotches and with or without distinct horizontal stripes on body and head.

Distribution

From the Persian Gulf to the Mozambique Channel, and in the Andaman Sea.

Similarity

The most similar genus is *Sirembo* (see respective genus account).

Remarks

The new generic definition requires the transfer of *Spottobrotula amaculata* to *Sirembo*. Three *Spottobrotula* species are here recognized as valid: *Sp. mahodadi*, *Sp. mossambica* sp. nov. and *Sp. persica* sp. nov.

Key to species of *Spottobrotula*

1a. A distinct black band from eye to behind tip of pectoral fin. Prepelvic length 10.5–13.0% SL ..... *Sp. mossambica* sp. nov.
1b. No black band on head and body. Prepelvic length 13.0–17.5% SL 2
2a. Head and body with large dark spots. Pectoral fin rays 30. Pelvic fin length 22.5% SL ..... *Sp. mahodadi*
2b. Head and body with light spots. Pectoral fin rays 23–24. Pelvic fin length 18–19% SL ..... *Sp. persica* sp. nov.

Spottobrotula mahodadi Cohen & Nielsen, 1978 (Table II; Figures 1, 4, 7 and 8)

Spottobrotula mahodadi Cohen & Nielsen, 1978: 41, fig. 64 (type locality Andaman Islands, off Barren Island); Cohen & Nielsen 1982: 500 and table 2 (misidentification); Nielsen et al. 1999: 91.

Holotype: KUMF 02842, SL 216 mm, female, Andaman Sea, Andaman Islands, off Barren Island, hook and line, *c.* 40 m, 14–15 April 1970.

Diagnosis

Spottobrotula mahodadi differs from the other two *Spottobrotula* species by having a uniformly brown body and the head with 25–30 dark spots, most of which are placed above the lateral line (size of spots about half eye diameter), and by having 10–15 smaller dark spots on the dorsal fin. Also the following combination of characters is diagnostic: pelvic fins inserted below preopercle; prepelvic length 17.5% SL; 18 scale rows between origin of dorsal fin and lateral line; 11 long rakers on anterior gill arch; pseudobranch with 35 filaments; and pectoral fin with 30 rays.

Description

The principal meristic and morphometric characters are shown in Table II. Body short and robust, with an indistinct lateral line having an upward bend above pectoral fins. Head and body completely covered with overlapping, elongate, cycloid scales. Length of a scale from below pectoral fin 3.5 mm (1.6% SL). Number of scales between origin of dorsal fin and lateral line 18. Snout blunt. Origin of dorsal fin above precaudal vertebra 3. Base of thick pelvic fins below opercle, reaching almost to anus; pelvic rays distally with many small papillae. Diameter of eye shorter than length of snout. Anterior nostril placed midway between upper lip and eye, with raised rim, posterior nostril a simple pore. Upper jaw ends just behind eye. Opercle with strong spine not reaching hind margin of opercle. No spines on preopercle. Anterior gill arch with one knob-like and three long rakers on upper branch, one long raker in the angle, and lower branch with 7–8 long rakers and 2–4 small knobs. The longest raker equals the longest gill filament in length. Pseudobranchial filaments about 35.

Head pores. Infraorbital pores 6, three anterior and three very small posterior pores; supraorbital pore 1; mandibular pores 6, three anterior and three very small posterior pores; lower preopercular pore 1 (small).

Dentition. Palatines with 4–5 irregular rows of small, granular teeth, decreasing to one row posteriorwards. Vomer subtriangular with many small, granular teeth. Premaxillaries and dentaries with many small, granular teeth anteriorly, decreasing posteriorwards. One elongate median basibranchial tooth patch.

Otolith (Figure 8). Thick, large otolith with strongly convex inner face and nearly flat outer face. Otolith length to height 1.4. Anterior and posterior tips ventrally shifted; dorsal rim strongly and very regularly curved. Sulcus very large, closely reaching anterior and posterior tips of otolith, with undivided

Table II. Meristic and morphometric characters of *Spottobrotula* spp. (only the 271 mm SL paratype of *Sp. persica* sp. nov. examined in detail). Format of second column for *Sp. mossambica*: minimum (average) maximum.

	Sp. mossambica sp. nov.			*Sp. persica* sp. nov.			*Sp. mahodadi*
	HT ZMUC P771715	HT+13PT	*n*	HT ZMUC P771720	PT	Non-type ZMUC P771716	HT KUMF 02842
Standard length (in mm) – SL	183	172–287	14	302	271	256	216
Meristic characters							
Dorsal fin rays	100	98 (101.0) 104	14	101	100	101	104
Caudal fin rays	9	9	13	9		9	8
Anal fin rays	74	72 (74.4) 76	14	73	71	76	78
Pectoral fin rays	23	23 (24.2) 26	14	23	24	23	30
Pelvic fin rays	2	2	14	2	2	2	2
Pseudobranchial filaments	40	30 (39.0) 42	14	35	32	35	35
Precaudal vertebrae	15	15 (15.1) 16	14	15	15	15	15
Total vertebrae	54	53 (53.9) 55	14	54	54	55	56
Long rakers on anterior gill arch	10	9 (10.1) 11	14	11	10	12	11
Total gill rakers	18	18 (18.9) 20	13	19	18	20	16
Ant. dorsal ray above vertebra no.	1	0 (0.9) 1	14	1	1	3	4
Ant. anal ray below dorsal fin ray no.	30	29 (30.4) 32	14	30	31	30	30
Ant. anal ray below vertebra no.	15	15 (18.1) 19	14	20	19	19	19
Scales between dorsal origin and lateral line	15	14 (14.9) 15	11	15	14	15	18
Morphometric characters in per cent SL							
Head length	22.5	22.5 (24.1) 26.0	14	25.0	25.0	25.0	22.0
Depth origin anal fin	20.0	17.5 (19.3) 21.0	13	23.0	22.5	20.0	19.0
Upper jaw length	10.5	10.5 (11.6) 13.0	14	12.0	12.5	12.0	10.5
Posterior height of maxillary	4.1	3.1 (3.9) 4.6	14	4.4	4.9	3.9	2.7
Diameter of eye window	4.9	4.9 (5.4) 5.9	14	6.2	5.5	6.4	4.6
Interorbital width	5.7	5.1 (5.6) 6.6	13	5.4	6.1	5.2	5.7
Postorbital length	12.0	12.0 (13.8) 14.5	13	14.0	14.0	13.5	12.5
Prepelvic length	12.5	10.5 (11.9) 13.0	13	13.0	13.5	14.0	17.5
Preanal length	46.0	41.0 (44.9) 47.5	14	48.0	45.0	47.5	43.5
Predorsal length	22.0	21.5 (22.7) 24.5	14	26.0	25.0	25.5	24.0
Base of pelvic fin to anal fin origin	34.0	30.5 (32.8) 36.0	13	35.0	31.5	34.0	28.0
Pectoral fin length	10.5	9.9 (11.0) 11.5	13	11.5	10.5	11.0	12.0
Pelvic fin length	15.5	15.0 (15.7) 17.0	12	18.0	18.0	19.0	22.5

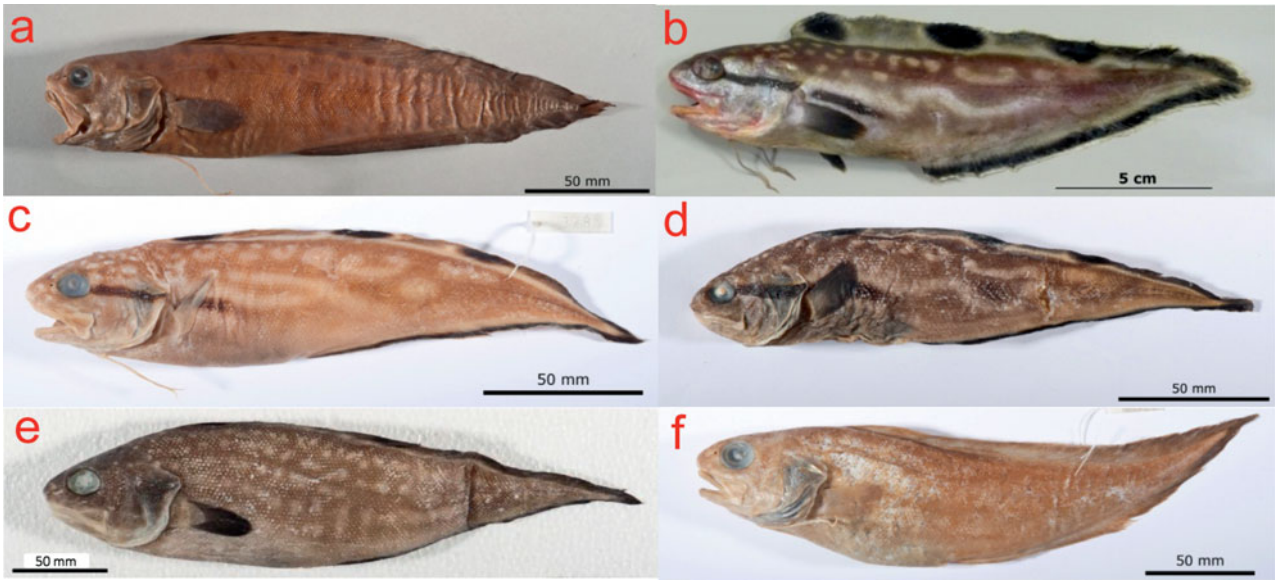

Figure 7. *Spottobrotula* spp.: (a) *Sp. mahodadi*, KUMF 02842, holotype, SL 216 mm (preserved for 42 years); (b) *Sp. mossambica*, SL 175 mm (fresh, caught off Oman, 18°55′N 57°57′E, 116 m depth, Darren Stevens photo); (c) *Sp. mossambica*, ZMUC P771715, holotype, SL 183 mm (preserved for 35 years); (d) *Sp. mossambica*, ZMUC P771721, paratype, SL 178 mm (preserved for five years); (e) *Sp. persica*, ZMUC P771720, holotype, SL 302 mm (preserved for one year; shown mirror-inverted for comparative reasons); (f) *Sp. percica*, ZMUC P771716, SL 256 mm (preserved for 24 years).

colliculum and ventral indentation at about middle of sulcus, dorsal rim of sulcus strongly curved. Otolith height to sulcus height 1.5.

Axial skeleton (based on radiographs). Precaudal vertebrae 15. Anterior neural spine almost as long as second spine. Neural spines 2–15 with blunt tips. Bases of neural spines 4–10 enlarged. Parapophyses on vertebrae 8–15, pleural ribs on vertebrae 2–15 and epipleural ribs on vertebrae 4–14.

Coloration (Figure 7a)

Body with about 30 dark brown, rounded spots, size about half of orbit diameter, distributed in random configuration mostly on upper 2/3 of body, 8–10

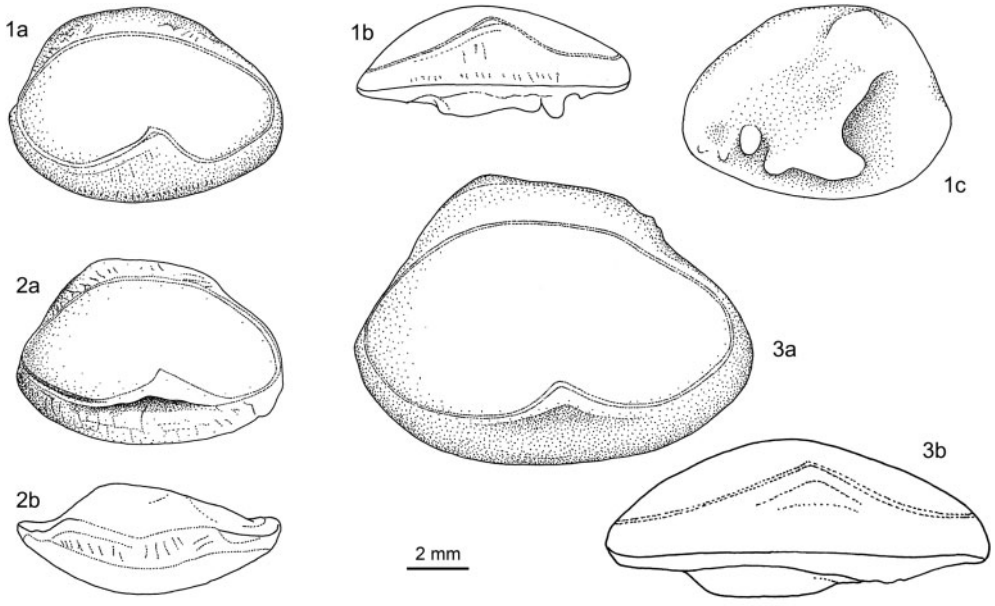

Figure 8. *Spottobrotula* (right otoliths): (1) *Sp. mahodadi*, KUMF 02842, holotype, SL 216 mm (1a median view, 1b ventral view, 1c external view); (2) *Sp. mossambica*, ZMMSU 12209, SL 265 mm (2a median view, 2b dorsal view); (3) *Sp. persica*, ZMUC P771720, holotype, SL 302 mm (3a median view, 3b ventral view).

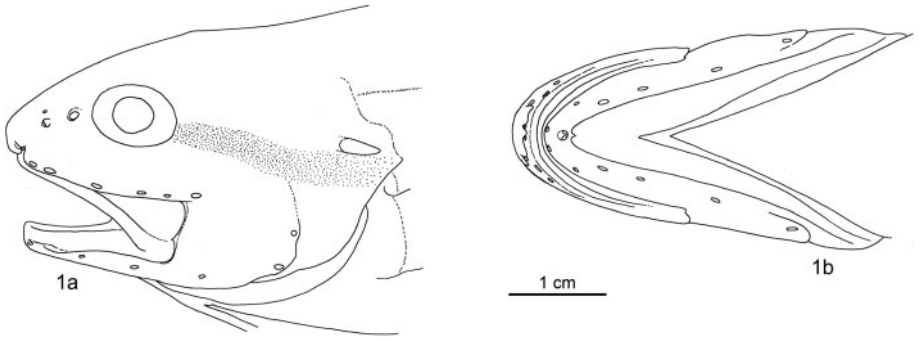

Figure 9. *Spottobrotula mossambica*, ZMUC P771715, holotype, SL 183 mm, head pores: (1a) lateral view, (1b) ventral view.

spots forming dorsally a row below anterior 3/4 of dorsal fin base, and 10–15 additional similar-sized spots on ventral part of dorsal fin. Four dark brown spots along dorsal fin margin, reaching down maximally to distalmost third of fin, the largest spot placed close to fin origin, one at midbody and two more posteriorly. Head and body brown in preserved holotype.

Distribution

Only known from the holotype, caught with hook and line at a depth of 40 m near Barren Island, Andaman Islands, Andaman Sea.

Similarity

Spottobrotula mahodadi is most similar to *Sp. persica* sp. nov. by not showing a black band on the head and anteriorly on the body, unlike the third species, *Sp. mossambica* sp. nov. *Spottobrotula mahodadi* has large, dark spots on the head and body, and 30 pectoral fin rays, while *Sp. persica* sp. nov. has light spots on the head and body, and 24 pectoral fin rays.

Remarks

Only known from the holotype. The specimen ZMMSU 12209 in Cohen & Nielsen (1982, table 2) is now referred to a new species herein described as *Spottobrotula mossambica*.

Spottobrotula mossambica sp. nov.
(Table II; Figures 1, 4 and 7–9)

Spottobrotula mahodadi Cohen & Nielsen, 1982: 500 and table 2 (in part: specimen ZMMSU 12209).

Material examined (14 specimens, 172–287 mm SL).

Holotype: ZMUC P771715, SL 183 mm, Mozambique Channel, 19°35′S, 36°15′E, RV *Nikolai Reshetnyak*, cruise 12, trawl no. 6, depth 45 m, 18 December 1978.

Paratypes: ZMMSU 12209, SL 265 mm, female, off Oman, 17°55′N, 57°01.6′E, RV *Akademik Knipovich*, st. 305, bottom trawl, 60–75 m, 13 January 1966; ZMUC P77810 (SL 263 mm) and LACM 58197-1 (SL 217 mm), off Mozambique, 19°09′S, 36°51′E, RV *Prof. Mesiatzev*, st. 290, bottom trawl, 73–75 m, 4 August 1977; USNM 391201, SL 203 mm, off Somalia, 11°20′12″N, 51°09′40″E, RV *Beinta*, st. 11, trawl, 0–33 m, 31 March 1987; SAIAB 189152, SL 173 mm, off Oman, 18°38′N, 57°26′E, RV *Al Mustaqila 1*, cruise OMA0701, st. 228, bottom trawl, 72 m, 4 November 2007; SAIAB 189250, SL 273 mm, off Oman, 18°33′N, 57°16′E, RV *Al Mustaqila 1*, cruise OMA0701, st. 230, bottom trawl, 72 m, 4 November 2007; ZMUC P771721, SL 178 mm, off Oman, 18°17′N, 57°08′E, RV *Al Mustaqila 1*, cruise OMA0701, st. 243, bottom trawl, 82 m, 5 November 2007; SAIAB 189251, SL 276 mm, off Oman, 18°53′N, 57°30′E, RV *Al Mustaqila 1*, cruise OMA0803, st. 456, bottom trawl, 29 m, 14 September 2008; SAIAB 118945, SL 172–183 mm (2 specimens), off Oman, 19°25′N, 57°48′E, RV *Al Mustaqila 1*, cruise OMA0803, st. 474, bottom trawl, depth 25 m, 15 September 2008; SAIAB 189252, SL 250 mm, off Oman, 19°31′N, 57°53′E, RV *Al Mustaqila 1*, cruise OMA0803, st. 476, bottom trawl, 22 m, 15 September 2008; SAIAB 189253, SL 287 mm, off Oman, 19°58′N, 58°22′E, RV *Al Mustaqila 1*, cruise OMA0803, st. 514, bottom trawl, 31 m, 17 September 2008; SAIAB 189255, SL 228 mm, off Oman, 20°02′N, 58°30′E, RV *Al Mustaqila 1*, cruise OMA0803, st. 512, bottom trawl, 40 m, 17 September 2008.

Diagnosis

Spottobrotula mossambica sp. nov. has a broad, black band from the eye to behind the pectoral fin and several light spots dorsally on the head and body as large as the eye. Also the following combination of characters is diagnostic: pelvic fins inserted below end of upper jaw; prepelvic length 10.5–13.0% SL; 14–15 scale rows between origin of dorsal fin and

lateral line; 9–11 long rakers on anterior gill arch; pseudobranch with 30–42 filaments; pectoral fins with 23–26 rays; anterior dorsal fin ray placed in front of or above vertebra 1 except for one above vertebra 3; three ocelli on dorsal fin; and a black band on anal fin leaving a thin unpigmented margin.

Description

The principal meristic and morphometric characters are shown in Table II. When the holotype and paratypes differ the data of the paratypes are mentioned in parentheses. Body robust with tapering caudal part, highest above base of pectoral fin. Head and body completely covered by overlapping, cycloid scales. Length of a scale from below pectoral fin 2.6% SL (SL 250 mm). Lateral line curving slightly upwards above pectoral fins. Snout rounded, slightly protruding over upper jaw symphysis. Mouth horizontal and maxilla vertically expanded, ending below or just behind posterior edge of eye. Numerous small papillae on lips. Anterior nostril with a short tube, placed midway between upper lip and posterior nostril, the latter a mere hole. Diameter of eye equal to or slightly longer than snout. Strong opercular spine ending short of hind margin of opercle. No spines on preopercle. Origin of dorsal fin far forward, above or anterior to hind margin of opercle. Anal fin origin somewhat anterior to midpoint of body. Pectoral fin placed below midline of body, with peduncle much higher than long. Distinct skin flap above base of pectoral fin. Pelvic fin rays rather thick, with base below end of maxillary; anal fin ending about halfway to anal fin origin. Anterior gill arch with one (0–2) short, knob-like and three (2–4) long rakers on upper branch, one long raker in the angle between the two branches and lower branch with seven (5–7) long rakers followed by three (2–7) knob-like rakers. Pseudobranchs with 40 (30–42) filaments.

Head pores (Figure 9). Infraorbital pores 6–7, three anterior and 3–4 large posterior pores; supraorbital pores 2–3, thereof one on occiput above and behind eye (not shown in Figure 9); mandibular pores 6, three anterior and three large posterior pores; lower preopercular pores 2 (large).

Dentition. Palatines, premaxillaries, vomer and dentaries with small, pointed teeth in irregular rows. Vomer subtriangular. One elongate, median basibranchial tooth patch.

Otolith (Figure 8). Thick, large otolith with strongly convex inner face and moderately convex outer face. Otolith length to height 1.4. Anterior and posterior tips ventrally shifted; dorsal rim strongly and regularly curved. Sulcus very large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation at about middle of sulcus, dorsal rim strongly curved. Otolith height to sulcus height 1.4–1.5.

Axial skeleton (based on radiographs). Precaudal vertebrae 14–16. Anterior neural spine 2/3–5/6 length of second spine. Neural spines 3–9 depressed and decreasing in length and with blunt tips. Bases of neural spines 4 to 10–11 enlarged. Parapophyses on vertebrae 8 to 14–16. Pleural ribs on vertebrae 3 to 13–15 and epipleural ribs indistinct.

Coloration (Figures 7b,c,d)

Dark stripe as wide as pupil, from eye to posterior edge of opercle, sparing out above pectoral fin origin, and ending behind pectoral fin. Several pale spots or larger blotches of different form above and below lateral line, extending anteriorly to dorsal head behind eye. Dorsal fin with three black rounded spots, up to twice as wide as eye window, the smallest one placed close to fin origin, the largest at midbody and one at 2/3 length of fin; all three spots surrounded by contrasting white rings, thus forming ocelli, also distinct in preserved specimens. Dorsal fin in between ocelli weakly pigmented distally, a dark stripe behind the posteriormost ocellus, as wide as eye window, leaving a thin unpigmented fin margin. Anal fin with dark stripe that covers almost completely distal half of fin, leaving a thin, unpigmented margin distally. When fresh, head light grey below level of eyes; jaws, margins of maxilla pale rose, and ventral area of head pale rose. Head and body brown dorsally, becoming lighter towards ventral side, belly pale grey, pectoral fins black and pelvic fins pale.

Similarity

Spottobrotula mossambica is distinctly different from both of the other two species, *Sp. mahodadi* and *Sp. persica*, by the dominant black bands running from the eye postero-ventrally to behind the pectoral fin. It furthermore differs from all other species of the genera *Sirembo* and *Spottobrotula* by having two supraorbital pores (vs. 0 or 1) and large posterior infraorbital and posterior mandibular pores.

Distribution

Known from Oman to the Mozambique Channel, at depths from 22 to 82 m.

Etymology

The species is named after the area, the Mozambique Channel, in which the holotype was caught.

Remarks

Spottobrotula mossambica and *Sirembo jerdoni* both have black, rounded spots on the dorsal fin surrounded to different degrees by contrasting white rings, thus resembling the ocelli occurring in several *Neobythites* species (Uiblein & Nielsen 2005). While in *Si. jerdoni* only a single rather incomplete ocellus is sometimes present, *Sp. mossambica* shows three well-developed ocelli that are also retained in preserved fish.

Spottobrotula persica sp. nov.
(Table II; Figures 1, 4, 7 and 8)

Material examined (four specimens, 256–302 mm SL).

Holotype: ZMUC P771720, SL 302 mm, Persian Gulf, 27°58′N, 51°01′E, bottom trawl, 45 m, 4 July 2012.

Paratypes: two specimens, Iranian Shrimp Research Center, Bushehr (no catalogue numbers), SL 271 mm and 298 mm, same data as for holotype.

Tentatively referred specimen: ZMUC P771716, SL 256 mm, off Sokotra Island, 12°20.6′N, 53°09.4′E, RV *Dmitry Stephanov*, cr. 5, st. 144/12, bottom trawl, 480–515 m, 22 October 1989.

Diagnosis

Spottobrotula persica differs from the other two *Spottobrotula* species by the large, white spots dorsally on the head and body, its brown background colour speckled white by the underlying scales and a distinct, brown lateral line. Also the following combination of characters is diagnostic: three ocelli in dorsal fin; no black markings on head and body; black band on anal fin; pelvic fins inserted below end of upper jaw; prepelvic length 13.0–14.0% SL; 14–15 scales between origin of dorsal fin and lateral line; 10–12 long rakers on anterior gill arch; pseudobranchs with 32–35 filaments; and pectoral fin rays 23–24.

Description

The principal meristic and morphometric characters are shown in Table II. When the holotype and the paratype examined by us differ, data for the paratype are mentioned in parentheses. Body short, with a distinct lateral line with an upward bend above pectoral fins. Head and body completely covered by overlapping, elongate, cycloid scales. Length of a scale from below pectoral fins 6 mm (2.2% SL). Number of scales between origin of dorsal fin and lateral line 15 (14). Snout protruding over upper jaw symphysis. Origin of dorsal fin above precaudal vertebra 1. Base of pelvic fins below end of upper jaw, reaching halfway to anus. Horizontal diameter of eye equals length of snout. Anterior nostril with a small skin flap, placed closer to posterior nostril than to upper lip; posterior nostril with a low rim. Upper jaw ends well behind eye. Opercle with a strong spine not reaching hind margin of opercle. No spines on preopercle. Anterior gill arch with one knob-like and three long rakers on upper branch, one long raker in the angle, and lower branch with seven long and seven knob-like rakers; the long rakers are rather short and broad (compared with the other two *Spottobrotula* species); longest raker about half length of longest filament. Pseudobranchial filaments 35 (32).

Head pores. Infraorbital pores 6, three anterior (one small and two large), and three posterior pores; supraorbital pores 3–4, thereof one on occiput above and behind eye and one at upper angle of gill opening; mandibular pores 6, three anterior and three posterior; lower preopercular pore one (small).

Dentition. Tooth bearing bones with small, pointed teeth in irregular rows. Vomer subtriangular. One elongate, median basibranchial tooth patch.

Otolith (Figure 8). Thick, large otolith with strongly convex inner face and flat outer face except for thickened region close to dorsal rim. Otolith length to height 1.35. Anterior and posterior tips ventrally shifted; dorsal rim strongly curved, its anterior portion slightly elevated. Sulcus very large, closely reaching anterior and posterior tips of otolith, with undivided colliculum and ventral indentation at about middle of sulcus, dorsal rim of sulcus strongly curved. Otolith height to sulcus height 1.5.

Axial skeleton (based on radiographs). Precaudal vertebrae 15. Anterior neural spine almost as long as second spine. Neural spines 2–15, almost equal in length; spines numbers 3–9 slightly depressed. Bases of neural spines 3–10 enlarged. Parapophyses developed on vertebrae 9–15. Pleural ribs on vertebrae 3–15, and epipleural ribs indistinct.

Coloration (Figures 7e, f)

Two irregular rows of pale spots below and two above lateral line, the latter extending anteriorly to head, becoming larger and partly overlaying posteriorly and ventrally. In fresh fish the head at and below level of eyes is dark grey, jaws and hind margin of maxilla are pale rose and the margin of operculum and ventral area of head are pale. Head and body dark brown dorsally, becoming lighter towards ventral side, and belly pale brown. Pectoral fins black, pelvic fins pale and unpaired fins brown with dark brown margins, with three black regions

on dorsal fin, one close to origin, one at midbody and the smaller third posteriorly. A specimen preserved for 24 years from off Sokotra Island is almost entirely pale brown, only the unpaired fins with weak traces of darker fin margins.

Distribution

Spottobrotula persica is known from three specimens from the Gulf of Persia, trawled at 45 m, and from one specimen caught off Sokotra Island, from 480 to 515 m depth.

Etymology

The specific name refers to the type locality, the Gulf of Iran (Persia).

Similarity

Spottobrotula persica sp. nov. is most similar to *Sp. mahodadi* (see respective species account).

Remarks

After we examined the holotype and a paratype; we have seen photos of a third specimen (298 mm SL) from the same catch kept at the Iranian Shrimp Research Center. After confirmation of important characters by Mr Qasem Gharibi from that institute, we refer this specimen without doubt to *Sp. persica* sp. nov. and consequently have considered it as a paratype. The fourth specimen (ZMUC P771716), though being morphologically similar to the type material, is only tentatively referred to this species, as it is completely bleached and collected far from the type locality at a much greater depth (480–515 vs. 45 m).

Discussion

The present study allows proper distinction between the two genera *Sirembo* and *Spottobrotula*, clarifying also their validity. The distinction between the two genera based on otoliths also provides important information for studies of the fossil record. Fossil representatives related to the genera *Sirembo* and *Spottobrotula* are entirely based on otoliths. Several species were originally described as belonging to *Sirembo*, but only *Sirembo boettgeri* (Koken, 1891) from the Late Oligocene (28–23 Ma) of the North Sea Basin can be considered as a proven fossil record of the genus (Schwarzhans 1994). There is, however, a multitude of otolith-based species in the Eocene and Palaeocene that exhibit plesiomorphic morphologies thought to represent extinct fossil genera related to *Sirembo*. For such forms the following otolith-based fossil genera have been introduced: *Joenielsenia* Schwarzhans, 1981, *Nolfophidion* Schwarzhans, 1981, *Preophidion* Frizzell & Dante, 1965 and *Sirembola* Schwarzhans, 1981. The Late and Middle Eocene of North America has yielded otoliths strikingly resembling those of the genus *Spottobrotula* in the large sulcus and its morphology, but differing either in a thin appearance (fossil otolith-based genus *Xenosirembo* Schwarzhans, 1981) or the absence of an indentation of the ventral rim of the sulcus (fossil otolith-based genus *Signata* Dante & Frizzell, 1965). In any case, these data indicate that a group of Recent genera comprising *Sirembo*, *Spottobrotula* and possibly *Petrotyx* are of early phylogenetic origin and can be confidently tracked back in geological history to Eocene/Palaeocene times, nearly 60 million years ago (Schwarzhans 2012).

The discovery of three new species, raising the number of known species of the two genera from five to eight, and the new record of *Sirembo jerdoni* from Vietnam demonstrate the need to further explore coastal areas of the Indo-Pacific for yet undetected biodiversity. When considering the wide and rather disjunct distribution of some of the species like *Si. imberbis* and *Si. jerdoni*, one may assume that there exist still undiscovered populations. In some areas, where several of the species have been found to co-occur, e.g. off northern Australia, these associations may play an important ecological role in shelf and upper-slope ecosystems.

This study is the first to report the occurrence of dorsal fin ocelli in an ophidiid species not belonging to the genus *Neobythites*. *Spottobrotula mossambica* has well-developed ocelli (according to the strict definition of dark spots surrounded by a contrasting white ring) of rather constant size and position on the fin used for detailed studies of those characters in *Neobythites* species (Uiblein & Nielsen 2005). Each of the three ocelli of *Sp. mossambica* resembles in placement and size a corresponding ocellus in distinct *Neobythites* species and hence may contribute to confusion. However, the combination of an ocellus close to the fin origin ('anterior'), with one at midbody ('central') and one at 2/3 of the fin ('first posterior ocellus'), is unique, as among the 23 ocellus-bearing *Neobythites* species three have an anterior and a central ocellus, but no posterior one (s), 10 have a central and one or several posterior ocelli, and 10 have only a single central ocellus (Uiblein & Nielsen 2005; Nielsen et al. 2009). In *Neobythites*, the formation of ocelli has been related to distinct ecological functions such as visually based predator avoidance or social communication that may be of particular importance in shallower, sufficiently illuminated habitats (Uiblein & Nielsen 2005). Such

ecological functions may also be of relevance for *Sp. mossambica*, which occurs at 22–82 m, hence mostly shallower than the ocellus-bearing *Neobythtes* species (67–801 m; Uiblein & Nielsen 2005).

Acknowledgements

We wish to thank the following persons for providing data and/or material: Neil Bagley (NIWA), Daniel Cohen (San Francisco), Gavin Dally (NTM), Amanda Hay (AMS), Alastair Graham (CSIRO), Wouter Holleman (SAIAB), Jeffrey Johnson (QM), Mark McGrouther (AMS), Sue Morrison (WAM), Sandra Raredon (USNM), Rob Robins (UF), Evgeny V. Romanov (IRD), David Smith (USNM), Duangdee Teerapong (KUMF) and Jeffrey Williams (USNM). Photos were prepared by Marcus Krag and Søren Nielsen (ZMUC), except for Figures 5a, 5b, 5c, 5f and 7b. For the provision of material we thank Laith A. Jawad, Manukau, Auckland, NZ, and Qasem Gharibi, Iran Shrimp Research Center, Bushehr; special thanks to Qasem Gharibi for his valuable help and information concerning the specimens from the Gulf of Persia. The third author (FU) thanks the South African Institute for Aquatic Biodiversity, the Nansen Programme of the Center for Development Cooperation in Fisheries at the Institute of Marine Research, Bergen, and the Russian-Vietnamese Tropical Research and Technological Center for travel and/or logistic support. We thank the two anonymous referees for their very valuable comments.

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Editorial responsibility: Christopher Kenaley